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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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ART UNIT	**PAPER NUMBER**
2129	

DATE MAILED: 03/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/600,991	CHEN ET AL.	
	Examiner	Art Unit	
	Benjamin J. Buss	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2003 and 1 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *6/19/2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/4/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 1-25 are pending in this application.

Priority

Examiner acknowledges Applicant's claim for priority based on PCT/US01/49193 filed on 12/19/2001, which claims priority from U.S. Provisional 60/299,002 filed on 6/19/2001 and U.S. Provisional 60/256,279 filed on 12/19/2000.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim1-25 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

- Claims 1-25: The claimed invention is not a practical application that produces a useful, concrete, and tangible result. The claimed invention manipulates data, but does not produce a tangible useful, concrete, and tangible real-world result that can be perceived by the senses. Therefore, claims 1-25 are non-statutory.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 4-6, 13, 16, and 21-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

- Claim 4 is directed to combining the outputs of said neural network to generate an average value for each depth point in the borehole. According to claim 3, the plurality of outputs represent the value of the

parameter at a plurality of depth points within the range of depths. If each output represents the value of the parameter at a depth, . It is not clear how the outputs could be combined to generate an average value for each depth point given that each output already represents the value of the parameter at a particular depth. Therefore, the person of ordinary skill in the art would not be enabled to make and/or use this invention.

- Claims 5-6, 13, 16, and 21-22 claim using synthetic responses and the formation models to train artificial neural networks to generate the formation models. It is not clear how the formation models can be used to train the artificial neural networks before said formation models have been generated by said artificial neural network. Therefore, the person of ordinary skill in the art would not be enabled to make and/or use this invention.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 5, 10, 13, 16, and 20-22 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claims 1, 5, 10, 13, and 20-21 recite the limitation "the output signals" in line 1. There is insufficient antecedent basis for this limitation in the claim.
- Claims 16 and 22 recite the limitation "The process" in line 1. There is insufficient antecedent basis for this limitation in the claim. Change to -- The method --.

Appropriate corrections are required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by **Mezzatesta** (USPN 5,862,513).

Claim 1:

Mezzatesta anticipates:

- an artificial neural network trained with a set of synthetic earth formation models selected to cover the operating range of a selected logging tool based on sensitivity and resolution limits of the logging tool and based on realistic ranges of formation parameters (C3-9 especially C3:25-C6:35 and C9:35-55; Also see Figure 1A).

Claim 2:

Mezzatesta anticipates:

- said logging tool output signals are a series of samples each representing the signal at a depth point in said borehole (C3-9 especially C3:64-C4:3 and C8:65-C9:20; Also see Figures 4A, 4B, and 4C), and
- said neural network has a plurality of inputs receiving the samples from a range of depths in the borehole and one output representing the parameter at a depth point within the range of depths (C3-9 especially C3:35-C4:35 and C5:3-10 and C8:65-C9:20; Also see Figures 2 and 4C).

Claim 3:

Mezzatesta anticipates:

- said logging tool output signals are a series of samples each representing the signal at a depth point in said borehole (C3-9 especially C3:64-C4:3 and C8:65-C9:20; Also see Figures 4A and 4B), and
- said neural network has a plurality of inputs receiving the samples from a range of depths in the borehole and a plurality of outputs representing the value of the parameter at a plurality of depth points within the range of depths (C3-9 especially C3:35-C4:35 and C5:3-10 and C8:65-C9:20; Also see Figures 2 and 4C).

Claim 5:

Mezzatesta anticipates:

- creating a set of synthetic earth formation models selected to cover the operating range of a selected logging tool based on sensitivity and resolution limits of the logging tool and based on realistic ranges of formation parameters (C3-9 especially C3:25-C6:35 and C9:35-55);
- generating synthetic responses of the selected tool to each of the formation models (C3-9 especially C3:25-C6:35 and C9:35-55);
- using the synthetic responses and the formation models to train an artificial neural network to generate the formation models in response to the synthetic responses (C3-9 especially C4:63-C6:26; Also see Figures 1A and 1B); and
- processing actual logging signals from the selected tool with the trained neural network to produce a log of the earth parameter (C3-9 especially C6:5-31).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Mezzatesta** (USPN 5,862,513) in view of **Freedman** (USPN 5,210,691).

Claim 4:

Mezzatesta fails to teach:

- means for combining the outputs of said neural network to generate an average value for each depth point in the borehole.

Freedman teaches:

- means for combining the outputs of said neural network to generate an average value for each depth point in the borehole (C3-17 especially C13:66-C15:35).

Motivation:

Mezzatesta and **Freedman** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by combining the neural network outputs representing the earth parameter at varying depth in a way that resolves the data as taught by **Freedman** for the benefit of providing improved inversion and better resolution (**Freedman** C15:20-35).

Claim Rejections - 35 USC § 103

Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Mezzatesta** (USPN 5,862,513) in view of **Anderson** (USPN 3,954,006).

Claim 6:

Mezzatesta teaches:

- using the synthetic responses and the formation models to train one or more additional artificial neural network or networks to generate the formation models in response to the synthetic responses (C3-9 especially (C3-9 especially C4:63-C6:26; Also see Figures 1A and 1B);
- processing the actual logging signals from the selected tool with the additional trained neural network or networks to produce an additional log or logs of the earth parameter (C3-9 especially C6:5-31); and,

Mezzatesta fails to teach:

- combining the logs of the earth parameter to produce a composite log of the earth parameter.

Anderson teaches:

- combining the logs of the earth parameter to produce a composite log of the earth parameter (C4-18 especially C8:65-C9:55).

Motivation:

Mezzatesta and **Anderson** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by combining the logs of the earth parameter to create a composite log as taught by **Anderson** for the

benefit of making it so the viscosity of well bore fluids are not a factor in determining the fluid velocities (**Anderson** C9:40-55).

Claim 9:

Mezzatesta teaches:

- wherein the artificial neural network has a plurality of outputs, each providing an output corresponding to a different depth point in the borehole (C3-9 especially C3:35-C4:35 and C5:3-10 and C8:65-C9:20; Also see Figures 2 and 4C);

Mezzatesta fails to teach:

- combining the plurality of outputs according to borehole depth points to produce a log of the earth parameter.

Anderson teaches:

- combining the plurality of outputs according to borehole depth points to produce a log of the earth parameter (C4-18 especially C8:65-C9:55).

Motivation:

Mezzatesta and **Anderson** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by combining the logs of the earth parameter according to depth points to create a composite log as taught by **Anderson** for the benefit of making it so the viscosity of well bore fluids are not a factor in determining the fluid velocities (**Anderson** C9:40-55).

Claim Rejections - 35 USC § 103

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Mezzatesta** (USPN 5,862,513) in view of **Barber** (USPN 5,184,079).

Claim 7:

Mezzatesta fails to teach:

- wherein the selected logging tool is an induction logging tool having more than one transmitter receiver pair and the synthetic responses from the selected tool include responses from more than one transmitter receiver pair.

Barber teaches:

- wherein the selected logging tool is an induction logging tool having more than one transmitter receiver pair and the synthetic responses from the selected tool include responses from more than one transmitter receiver pair (C1-17 especially C1:13-60 and C8:60-C920).

Motivation:

Mezzatesta and **Barber** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by producing the synthetic logging responses using an induction logging tool having more than one transmitter receiver as taught by **Barber** for the benefit of obtaining a desired response (**Barber** C1:48-51).

Claim 8:

Mezzatesta fails to teach:

- wherein the selected logging tool is an induction logging tool having both in-phase and quadrature output signals and the synthetic responses from the selected tool include both signals.

Barber teaches:

- wherein the selected logging tool is an induction logging tool having both in-phase and quadrature output signals and the synthetic responses from the selected tool include both signals (C1-17 especially C1:13-60 and C8:60-C920; Also see Figure 13a).

Motivation:

Mezzatesta and **Barber** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by producing the synthetic logging responses using an induction logging tool including both in-phase and quadrature output signals as taught by **Barber** for the benefit of providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

205 ***Claim Rejections - 35 USC § 103***

Claims 10 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Mezzatesta** (USPN 5,862,513) in view of **Strickland** (USPN 5,867,806).

Claim 10:

210 **Mezzatesta** teaches:

- An artificial neural network trained with a set of synthetic earth formation models (C3-9 especially C3:25-C6:35 and C9:35-55; Also see Figure 1A).

Mezzatesta fails to teach:

- a. a plurality of chirp models having continuously increasing layer thicknesses, each chirp model having
215 parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range, and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range, and
- b. a plurality of Oklahoma type models having parameter contrasts at layer interfaces limited to realistic
220 contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range.

Strickland teaches:

- a. a plurality of chirp models having continuously increasing layer thicknesses, each chirp model having
225 parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range, and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C18:15-65 and C5:58-60; Also see Figures 10-12), and
- b. a plurality of Oklahoma type models having parameter contrasts at layer interfaces limited to realistic
230 contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range and at least one model having a lower parameter limit

substantially at the lower limit of the selected tool operating range (C1-23 especially C14:24-C18:14 and C10:11-21 and C5:50-57; Also see Figures 7-9).

Motivation:

Mezzatesta and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by training the artificial neural network with well-known chirp formation models and Oklahoma formation models at various dip angles as taught by **Strickland** for the benefits of studying the effects of invasion and thickness of a bed (**Strickland** C17:18-20 and C18:47-48), determining the bed boundaries directly from the data without any user intervention (**Strickland** C18:7-9), improving processing near the edges (**Strickland** C18:63-65), and for easier comparison (**Strickland** C17:1-C18:2).

Claim 13:

Mezzatesta teaches:

- creating a set of synthetic earth formation models (C3-9 especially C3:25-C6:35 and C9:35-55);
- generating synthetic responses of the selected tool to each of the formation models (C3-9 especially C3:25-C6:35 and C9:35-55);
- using the synthetic responses and the formation models to train an artificial neural network to generate the formation models in response to the synthetic responses (C3-9 especially C4:63-C6:26; Also see Figures 1A and 1B); and
- processing actual logging signals from the selected tool with the trained neural network to produce a log of the earth parameter (C3-9 especially C6:5-31).

Mezzatesta fails to teach:

- a. a plurality of chirp models having continuously increasing layer thicknesses, each chirp model having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range, and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range, and

- b. a plurality of Oklahoma type models having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range.

Strickland teaches:

- a. a plurality of chirp models having continuously increasing layer thicknesses, each chirp model having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range, and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C18:15-65 and C5:58-60; Also see Figures 10-12), and
- b. a plurality of Oklahoma type models having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C14:24-C18:14 and C10:11-21 and C5:50-57; Also see Figures 7-9).

Motivation:

Mezzatesta and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by using for the synthetic earth formation models the well-known chirp formation models and Oklahoma formation models at various dip angles as taught by **Strickland** for the benefits of studying the effects of invasion and thickness of a bed (**Strickland** C17:18-20 and C18:47-48), determining the bed boundaries directly from the data without any user intervention (**Strickland** C18:7-9), improving processing near the edges (**Strickland** C18:63-65), and for easier comparison (**Strickland** C17:1-C18:2).

Claim Rejections - 35 USC § 103

Claims 16 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Mezzatesta** (USPN 5,862,513) and **Strickland** (USPN 5,867,806) in further view of **Anderson** (USPN 3,954,006).

Claim 16:

Mezzatesta teaches:

- using the synthetic responses and the formation models to train one or more additional artificial neural network or networks to generate the formation models in response to the synthetic responses (C3-9 especially (C3-9 especially C4:63-C6:26; Also see Figures 1A and 1B);
- processing the actual logging signals from the selected tool with the additional trained neural network or networks to produce an additional log or logs of the earth parameter (C3-9 especially C6:5-31); and,

The combination of **Mezzatesta** and **Strickland** fails to teach:

- combining the logs of the earth parameter to produce a composite log of the earth parameter.

Anderson teaches:

- combining the logs of the earth parameter to produce a composite log of the earth parameter (C4-18 especially C8:65-C9:55).

Motivation:

Anderson and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by combining the logs of the earth parameter to create a composite log as taught by **Anderson** for the benefit of making it so the viscosity of well bore fluids are not a factor in determining the fluid velocities (**Anderson** C9:40-55).

Claim 19:

Mezzatesta teaches:

- wherein the artificial neural network has a plurality of outputs, each providing an output corresponding to a different depth point in the borehole (C3-9 especially C3:35-C4:35 and C5:3-10 and C8:65-C9:20; Also see Figures 2 and 4C);

The combination of **Mezzatesta** and **Strickland** fails to teach:

- combining the plurality of outputs according to borehole depth points to produce a log of the earth parameter.

Anderson teaches:

- combining the plurality of outputs according to borehole depth points to produce a log of the earth parameter (C4-18 especially C8:65-C9:55).

Motivation:

Anderson and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by combining the logs of the earth parameter according to depth points to create a composite log as taught by **Anderson** for the benefit of making it so the viscosity of well bore fluids are not a factor in determining the fluid velocities (**Anderson** C9:40-55).

Claim Rejections - 35 USC § 103

Claims 17-18, 20-21, and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Mezzatesta** (USPN 5,862,513) and **Strickland** (USPN 5,867,806) in further view of **Barber** (USPN 5,184,079).

Claim 17:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the selected logging tool is an induction logging tool having more than one transmitter receiver pair and the synthetic responses from the selected tool include responses from more than one transmitter receiver pair.

Barber teaches:

- wherein the selected logging tool is an induction logging tool having more than one transmitter receiver pair and the synthetic responses from the selected tool include responses from more than one transmitter receiver pair (C1-17 especially C1:13-60 and C8:60-C920).

Motivation:

Mezzatesta, **Strickland**, and **Barber** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by producing the synthetic logging responses using an induction logging tool

having more than one transmitter receiver as taught by **Barber** for the benefit of obtaining a desired response (**Barber** C1:48-51).

Claim 18:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the selected logging tool is an induction logging tool having both in-phase and quadrature output signals and the synthetic responses from the selected tool include both signals.

Barber teaches:

- wherein the selected logging tool is an induction logging tool having both in-phase and quadrature output signals and the synthetic responses from the selected tool include both signals (C1-17 especially C1:13-60 and C8:60-C920; Also see Figure 13a).

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by producing the synthetic logging responses using an induction logging tool including both in-phase and quadrature output signals as taught by **Barber** for the benefit of providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

Claim 20:

Mezzatesta teaches:

- An artificial neural network trained with a set of synthetic earth formation models (C3-9 especially C3:25-C6:35 and C9:35-55; Also see Figure 1A).

Mezzatesta fails to teach:

- a. a plurality of chirp models having continuously increasing layer thicknesses, and having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces, each model having different upper and lower parameter limits, selected so that the highest and lowest parameter limits are substantially at the upper and lower limits of the selected tool operating range, and

- b. a plurality of Oklahoma type models having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces, each model having different upper and lower parameter limits, selected so that the highest and lowest parameter limits are substantially at the upper and lower limits of the selected tool operating range.

Strickland teaches:

- a. a plurality of chirp models having continuously increasing layer thicknesses, each chirp model having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range, and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C18:15-65 and C5:58-60; Also see Figures 10-12), and
- b. a plurality of Oklahoma type models having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C14:24-C18:14 and C10:11-21 and C5:50-57; Also see Figures 7-9).

Motivation:

Mezzatesta and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by training the artificial neural network with well-known chirp formation models and Oklahoma formation models at various dip angles as taught by **Strickland** for the benefits of studying the effects of invasion and thickness of a bed (**Strickland** C17:18-20 and C18:47-48), determining the bed boundaries directly from the data without any user intervention (**Strickland** C18:7-9), improving processing near the edges (**Strickland** C18:63-65), and for easier comparison (**Strickland** C17:1-C18:2).

The combination of **Mezzatesta** and **Strickland** fails to teach:

- The models having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces.

Barber teaches:

- The models having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces (C1-18 especially C2:59-C3:11 and C5:60-C6:10 and C10:15-55; Also see Figures 3, 4, 7 and 9)

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by having the contrast of the resistive bed be representative of realistic contrasts that may be encountered as taught by **Barber** for the benefit of providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

Claim 21:

Mezzatesta teaches:

- creating a set of synthetic earth formation models (C3-9 especially C3:25-C6:35 and C9:35-55);
- generating synthetic responses of the selected tool to each of the formation models (C3-9 especially C3:25-C6:35 and C9:35-55);
- using the synthetic responses and the formation models to train an artificial neural network to generate the formation models in response to the synthetic responses (C3-9 especially C4:63-C6:26; Also see Figures 1A and 1B); and
- processing actual logging signals from the selected tool with the trained neural network to produce a log of the earth parameter (C3-9 especially C6:5-31).

Mezzatesta fails to teach:

- a. a plurality of chirp models having continuously increasing layer thicknesses, and having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces, each model having different upper and lower parameter limits, selected so that the highest and lowest parameter limits are substantially at the upper and lower limits of the selected tool operating range, and
- b. a plurality of Oklahoma type models having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces, each model having different upper and lower parameter limits, selected so that the highest and lowest parameter limits are substantially at the upper and lower limits of the selected tool operating range.

Strickland teaches:

- a. a plurality of chirp models having continuously increasing layer thicknesses, each chirp model having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range, and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C18:15-65 and C5:58-60; Also see Figures 10-12), and
- b. a plurality of Oklahoma type models having parameter contrasts at layer interfaces limited to realistic contrasts found in actual earth formations, at least one model having an upper parameter limit substantially at the upper limit of the selected tool operating range and at least one model having a lower parameter limit substantially at the lower limit of the selected tool operating range (C1-23 especially C14:24-C18:14 and C10:11-21 and C5:50-57; Also see Figures 7-9).

Motivation:

Mezzatesta and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of **Mezzatesta** by training the artificial neural network with well-known chirp formation models and Oklahoma formation models at various dip angles as taught by **Strickland** for the benefits of studying the effects of invasion and thickness of a bed (**Strickland** C17:18-20 and C18:47-48), determining the bed boundaries directly from the data without any user intervention (**Strickland** C18:7-9), improving processing near the edges (**Strickland** C18:63-65), and for easier comparison (**Strickland** C17:1-C18:2).

The combination of **Mezzatesta** and **Strickland** fails to teach:

- The models having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces.

Barber teaches:

- The models having parameter contrasts of from about 10 to 1 to about 100 to 1 at layer interfaces (C1-18 especially C2:59-C3:11 and C5:60-C6:10 and C10:15-55; Also see Figures 3, 4, 7 and 9)

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by having the contrast of the resistive bed be representative of realistic contrasts that may be encountered as taught by **Barber** for the benefit of

providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

Claim 23:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the selected logging tool is an induction logging tool having more than one transmitter receiver pair and the synthetic responses from the selected tool include responses from more than one transmitter receiver pair.

Barber teaches:

- wherein the selected logging tool is an induction logging tool having more than one transmitter receiver pair and the synthetic responses from the selected tool include responses from more than one transmitter receiver pair (C1-17 especially C1:13-60 and C8:60-C920).

Motivation:

Mezzatesta, **Strickland**, and **Barber** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by producing the synthetic logging responses using an induction logging tool having more than one transmitter receiver as taught by **Barber** for the benefit of obtaining a desired response (**Barber** C1:48-51).

Claim 24:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the selected logging tool is an induction logging tool having both in-phase and quadrature output signals and the synthetic responses from the selected tool include both signals.

Barber teaches:

- wherein the selected logging tool is an induction logging tool having both in-phase and quadrature output signals and the synthetic responses from the selected tool include both signals (C1-17 especially C1:13-60 and C8:60-C920; Also see Figure 13a).

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by producing the synthetic logging responses using an induction logging tool including both in-phase and quadrature output signals as taught by **Barber** for the benefit of providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

Claim Rejections - 35 USC § 103

Claims 11-12 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Mezzatesta** (USPN 5,862,513) and **Strickland** (USPN 5,867,806) in view of **Barber** (USPN 5,184,079) in further view of **Girard** (USPN 3,509,458).

Claim 11:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 and
- the chirp models include at least one model with parameter contrasts at layer interfaces of about 10 to 1 and at least one model with parameter contrasts at layer interfaces of about 100 to 1.

Barber teaches:

- at least one model with parameter contrasts at layer interfaces of about 10 to 1 and at least one model with parameter contrasts at layer interfaces of about 100 to 1 (C1-18 especially C2:59-C3:11 and C5:60-C6:10 and C10:15-55; Also see Figures 3, 4, 7 and 9)

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by having the contrast of the resistive bed be representative of realistic contrasts that may be encountered as taught by **Barber** for the benefit of

providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

The combination of **Mezzatesta, Strickland**, and **Barber** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1.

Girard teaches:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 (C1-5 especially C4:32-62).

Motivation:

Girard and the combination of **Mezzatesta**, **Strickland** and **Barber** are from the same field of endeavor, induction logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta**, **Strickland**, and **Barber** by using a induction logging tool with a input signal ratio of 10,000:1 as taught by **Girard** for the benefit of recording a wide range of input signal amplitudes (**Girard** C4:59-62).

Claim 12:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 and
- the Oklahoma models have parameter contrasts at layer interfaces from about 10 to 1 to about 100 to 1.

Barber teaches:

- the Oklahoma models have parameter contrasts at layer interfaces from about 10 to 1 to about 100 to 1 (C1-18 especially C2:59-C3:11 and C5:60-C6:10 and C10:15-55; Also see Figures 3, 4, 7 and 9)

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta** and **Strickland** by having the contrast of the resistive bed be representative of realistic contrasts that may be encountered as taught by **Barber** for the benefit of

providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

The combination of **Mezzatesta, Strickland**, and **Barber** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1.

Girard teaches:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 (C1-5 especially C4:32-62).

Motivation:

Girard and the combination of **Mezzatesta**, **Strickland** and **Barber** are from the same field of endeavor, induction logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta**, **Strickland**, and **Barber** by using a induction logging tool with a input signal ratio of 10,000:1 as taught by **Girard** for the benefit of recording a wide range of input signal amplitudes (**Girard** C4:59-62).

Claim 14:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 and
- the chirp models include at least one model with parameter contrasts at layer interfaces of about 10 to 1 and at least one model with parameter contrasts at layer interfaces of about 100 to 1.

Barber teaches:

- at least one model with parameter contrasts at layer interfaces of about 10 to 1 and at least one model with parameter contrasts at layer interfaces of about 100 to 1 (C1-18 especially C2:59-C3:11 and C5:60-C6:10 and C10:15-55; Also see Figures 3, 4, 7 and 9)

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify

the combined teachings of **Mezzatesta** and **Strickland** by having the contrast of the resistive bed be representative of realistic contrasts that may be encountered as taught by **Barber** for the benefit of providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

The combination of **Mezzatesta, Strickland**, and **Barber** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1.

Girard teaches:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 (C1-5 especially C4:32-62).

Motivation:

Girard and the combination of **Mezzatesta**, **Strickland** and **Barber** are from the same field of endeavor, induction logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta**, **Strickland**, and **Barber** by using a induction logging tool with a input signal ratio of 10,000:1 as taught by **Girard** for the benefit of recording a wide range of input signal amplitudes (**Girard** C4:59-62).

Claim 15:

The combination of **Mezzatesta** and **Strickland** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 and
- the Oklahoma models have parameter contrasts at layer interfaces from about 10 to 1 to about 100 to 1.

Barber teaches:

- the Oklahoma models have parameter contrasts at layer interfaces from about 10 to 1 to about 100 to 1 (C1-18 especially C2:59-C3:11 and C5:60-C6:10 and C10:15-55; Also see Figures 3, 4, 7 and 9)

Motivation:

Barber and the combination of **Mezzatesta** and **Strickland** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify

the combined teachings of **Mezzatesta** and **Strickland** by having the contrast of the resistive bed be representative of realistic contrasts that may be encountered as taught by **Barber** for the benefit of providing sufficient information concerning the existence, depth location, quantity, et., of oil and gas trapped in the formations (**Barber** C1:12-34).

The combination of **Mezzatesta, Strickland**, and **Barber** fails to teach:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1.

Girard teaches:

- wherein the logging tool is an induction logging tool having a ratio of maximum sensitivity to minimum sensitivity of about 10,000 to 1 (C1-5 especially C4:32-62).

Motivation:

Girard and the combination of **Mezzatesta**, **Strickland** and **Barber** are from the same field of endeavor, induction logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta**, **Strickland**, and **Barber** by using a induction logging tool with a input signal ratio of 10,000:1 as taught by **Girard** for the benefit of recording a wide range of input signal amplitudes (**Girard** C4:59-62).

Claim Rejections - 35 USC § 103

Claims 22 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Mezzatesta** (USPN 5,862,513), **Strickland** (USPN 5,867,806), and **Barber** (USPN 5,184,079) in further view of **Anderson** (USPN 3,954,006).

Claim 16:

Mezzatesta teaches:

- using the synthetic responses and the formation models to train one or more additional artificial neural network or networks to generate the formation models in response to the synthetic responses (C3-9 especially (C3-9 especially C4:63-C6:26; Also see Figures 1A and 1B);

- processing the actual logging signals from the selected tool with the additional trained neural network or networks to produce an additional log or logs of the earth parameter (C3-9 especially C6:5-31); and,

The combination of **Mezzatesta**, **Strickland**, and **Barber** fails to teach:

- combining the logs of the earth parameter to produce a composite log of the earth parameter.

Anderson teaches:

- combining the logs of the earth parameter to produce a composite log of the earth parameter (C4-18 especially C8:65-C9:55).

Motivation:

Anderson and the combination of **Mezzatesta**, **Strickland**, and **Barber** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of **Mezzatesta**, **Strickland**, and **Barber** by combining the logs of the earth parameter to create a composite log as taught by **Anderson** for the benefit of making it so the viscosity of well bore fluids are not a factor in determining the fluid velocities (**Anderson** C9:40-55).

Claim 19:

Mezzatesta teaches:

- wherein the artificial neural network has a plurality of outputs, each providing an output corresponding to a different depth point in the borehole (C3-9 especially C3:35-C4:35 and C5:3-10 and C8:65-C9:20; Also see Figures 2 and 4C);

The combination of **Mezzatesta**, **Strickland**, and **Barber** fails to teach:

- combining the plurality of outputs according to borehole depth points to produce a log of the earth parameter.

Anderson teaches:

- combining the plurality of outputs according to borehole depth points to produce a log of the earth parameter (C4-18 especially C8:65-C9:55).

Motivation:

Anderson and the combination of **Mezzatesta**, **Strickland**, and **Barber** are from the same field of endeavor, borehole logging. It would have been obvious to one of ordinary skill in the art at the time of the

invention to modify the combined teachings of **Mezzatesta**, **Strickland**, and **Barber** by combining the logs of the earth parameter according to depth points to create a composite log as taught by **Anderson** for the benefit of making it so the viscosity of well bore fluids are not a factor in determining the fluid velocities (**Anderson** C9:40-55).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Adcock (USPN 5,008,845)
- Geyer (USPN 3,311,875)
- Hayes (USPN 3,784,828)
- Keskes (USPN 5,940,777)
- Li (USPN 5,684,693)
- Mazzagatti (USPN 2,836,356)
- Mills (USPN 5,536,938)
- Minerbo (USPN 6,216,089 and USPN 6,304,086)
- Strickland (USPN 6,606,565)
- Taner (USPN 6,374,185)
- Zhang (USPN 6,381,542)

Claims 1-25 are rejected.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Benjamin J. Buss whose telephone number is 571-272-5831. The examiner can normally be reached on M-F 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on 571-272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more
680 information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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BJB